Selected Items From the History of Pathology

The Cell Theory: A Foundation to the Edifice of Biology

One hundred and forty years ago, in 1839, Theodor Schwann published his celebrated book *Mikroskopische Untersuchungen über die Übereinstimmung in der Struktur und dem Wachsthum der Thiere und Pflanzen.*[1] Several months prior to this, Mathias Jacob Schleiden had published a monograph entitled "Beiträge zur Phytogenesis."[1] In these landmark publications, Schleiden and Schwann formulated what, with later modifications (see below), is now known as the "cell theory." It conceptualizes the cell as the *quantum minimum* of life, capable of independent development, yet an integral part of the organism as a whole: an individual in a society. Schleiden, a botanist, advanced the theory for plant cells; Schwann generalized it to all living organisms, animals as well as plants, thus giving a new perspective to biological sciences.

The cell theory formed a foundation to the edifice of modern biology. Prior to the formulation of this theory, biology was almost in a state of stagnation. In sharp contrast to physical sciences, which had already been taking giant strides for some 200 years, biology lacked a proper perspective and could not keep pace with the physical sciences. The epitome of this lack of perspective is seen following the observations of Robert Hooke. In the seventeenth century, with a rudimentary microscope, he observed tiny box-like structures in thin slices of a bottle cork. He coined the term "cells," but their significance he could not grasp. The finding was merely a curiosity. Almost two centuries passed before the cell theory was advanced, and from then on there was a golden age for biology. Today, when we look back, it is almost staggering to perceive the distance that has been covered during this relatively short period of 140 years.

The circumstances surrounding the establishment of the cell theory is shrouded in a cloud of controversies, in part because of Schleiden's disregard for his predecessors, coupled with Schwann's passive concurrence, and in part because of fundamental flaws in the theory as it was initially enunciated. Some of these flaws were later corrected by Rudolf Virchow, who coined the aphorism "Omnis cellula a cellula." These controversies were discussed during a symposium held on the occasion of the centenary of the formulation of the cell theory.[2] Nonetheless, there is little doubt that the cell theory helped start a new era in biology by providing a unifying mechanistic concept, necessary for inductive science.

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References

1. Schwann T: Microscopical researches into the accordance in the structure and growth of animals and plants. Translated by Henry Smith, who thoughtfully appended a translation of Schleiden's monograph (originally published in *Archiv für Anatomie, Physiologie und Wissenschaftliche Medicin*, 1938): "Contributions to phytogenesis." London, Sydenham Society, 1847
2. See, for instance, Biological Symposia, Vol 1, 1940